

## **Historic, archived document**

Do not assume content reflects current scientific knowledge, policies, or practices.

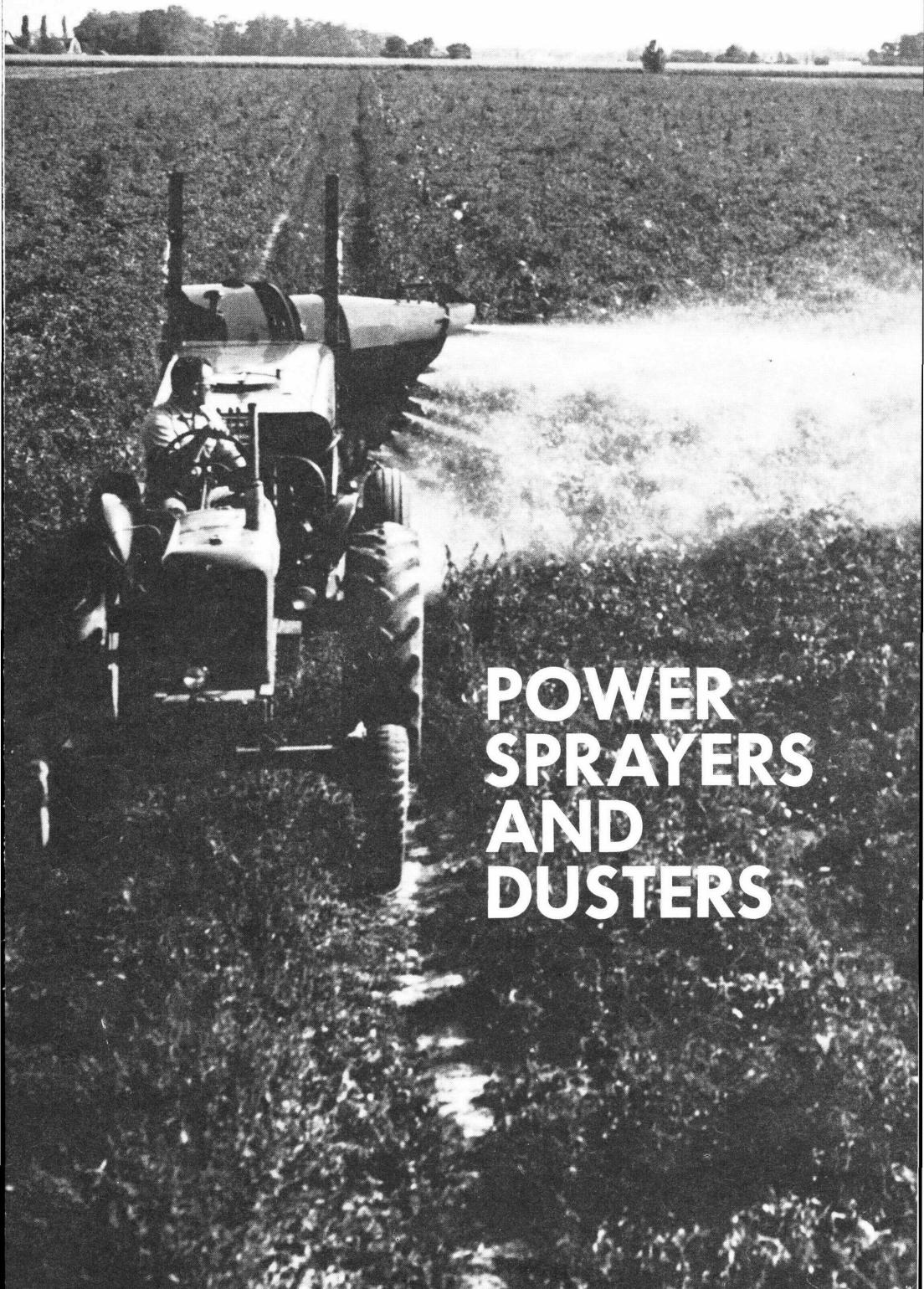
1542

FARMERS' BULLETIN NO. 2223

• S U.S. DEPARTMENT OF AGRICULTURE

1  
Ag 84F  
c. 3

C+F



# POWER SPRAYERS AND DUSTERS

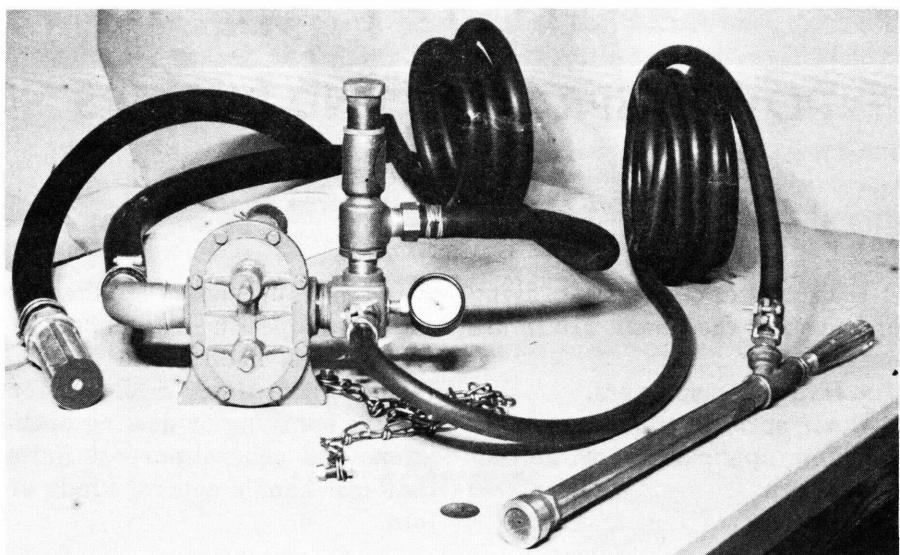


FIGURE 1.—Spray kit for a farm-assembled sprayer. The kit and a tank (usually one or more 55-gallon drums) are mounted on a tractor or a trailer and are driven either by power takeoff or by a separate engine.

capacity of the sprayer and the kinds of spray materials that can be handled.

The types of pumps available on manufactured sprayers or for assembling a unit are compared in the accompanying chart.

The type and size of pump needed depends upon the spray job or jobs. Some jobs are done

best with low-pressure and high-volume spraying. Others require high pressure and low volume. Still others can be done with low pressure and low volume. Size of the job—the number of acres, plants, or trees to be sprayed—is an important factor.

Spraying recommendations vary with different crops, and may even vary for a particular crop. In 1965, two recommendations for spraying potatoes called for—

1. A spraying pressure of 200 to 400 pounds per square inch (p.s.i.) and an application rate of 75 to 150 gallons per acre.

2. A spraying pressure of 40 to 80 p.s.i. and an application rate of 20 to 40 gallons per acre.

In 1965, recommendations for insect control on cotton called for application rates of from 1 to 15

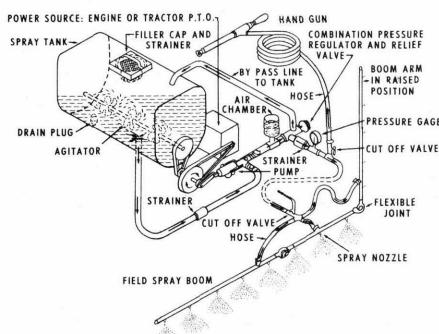


FIGURE 2.—Spraying system of a typical power sprayer.

*Comparison of Sprayer Pumps Available*

Type	Materials handled	Durability	Revolutions per minute (operating range)	Capacity in gallons per minute at zero pounds per square inch (approximate)	Maximum pressure in pounds per square inch (approximate)
Roller .....	Wide range with proper rollers.	Spraying pressure decreases with wear, but worn rollers are easily replaced.	300 to 1,000	1 to 35	250 to 350
Piston .....	Any .....	Long life .....	100 to 600	1½ to 60	800 to 1,000
Centrifugal .....	Any .....	Long life .....	1,200 to 3,500	0 to 120	200
Diaphragm .....	Any .....	Long life .....	200 to 1,200	1 to 10	100
Gear .....	Oil emulsions and non-abrasives. Not for wettable powders, except when gears are of nylon.	Limited life under adverse conditions. Spraying pressure and capacity decreases with wear.	500 to 1,800	5 to 20	100
Flexible impeller.	Wettable powders, mild abrasives.	Moderate .....	500 to 1,500	0 to 30	50
Sliding vane rotary.	Limited to oil and oil emulsions.	Spraying pressure and capacity decreases with wear.	500 to 600	5 to 20	125

gallons per acre. Recommendations for weed control in crops frequently call for application rates of from 20 to 40 gallons per acre at comparatively low spraying pressures. Your county agricultural agent or your State experiment station can advise on spraying recommendations in your locality and on your crops.

### Tank

Sprayer tanks may be made of metal or fiberglass.

Factory-assembled sprayer units usually have a metal tank, coated inside with a chemical-resistant material. The tank usually has rounded corners inside to facilitate the cleaning out of chemical residue.

Use of one or more 55-gallon drums is common on farm-assembled units. This reduces the cost of the sprayer, but the drums are more difficult to clean and usually less resistant to rust and chemicals than tanks designed especially for sprayers. The drums may be mounted horizontally or vertically on the tractor or on a trailer.

Sprayer tanks should have a large covered opening in the top, fitted with a removable strainer, to facilitate filling, inspection, and cleaning. A drain plug should be provided in the bottom to permit complete drainage when cleaning.

Capacity of the sprayer tank on commercially available units is usually 10 to 20 times the pumping capacity of the pump. For example, a 20-gallon-per-

minute pump would have a 200- to 400-gallon tank.

### Agitation of spray material

The two methods of agitating the spray material in the tank are:

- *Mechanical*—agitation provided by paddles or propeller.
- *Hydraulic*—agitation provided by the return flow of excess spray material from the pump.

Continuous, positive agitation is necessary in order to use the full range of spray materials—wettable powders, oil and water emulsions, and others. Mechanical agitation is considered better than hydraulic agitation. Excessive agitation of certain solutions and emulsions may cause foaming, heating, or other undesirable results. The label on the pesticide container may indicate the kind of agitation to use.

Mechanical agitation is usually provided with piston-type pumps and engine-run sprayers. Hydraulic agitation is often used with sprayers that have the pump driven by power takeoff.

### Distribution system

The four types of spray-distribution units are:

- Hand guns.
- Automatic spray heads.
- Spray booms.
- Boomless nozzles.

Hand guns are used for spraying fruit trees and livestock, for spraying in buildings, and for spraying herbicides along fence rows and industrial rights-of-way. They consist of one or more nozzles in a suitable mounting and a

fast-acting control valve. The valve serves as a cutoff and as a means of adjusting the spray pattern. Some guns may have two valves—one for cutoff and the other for adjusting the spray pattern.

Automatic spray heads are used for orchard spraying. They consist of a number of nozzles arranged on a vertical boom or series of booms. Most of them have an automatic oscillating mechanism.

Spray booms are designed for spraying field and row crops. They consist of a pipe or tubing on which nozzles are spaced and mounted. (The pipe or tubing can be a part of the system that supplies spray to the nozzles.) They are usually mounted horizontally on the sprayer and can be raised and lowered. The most common boom lengths for field spraying are 18 and 21 feet. Longer booms up to 30 feet and more in length are available.

Modified "spray booms" include single nozzles or sets of nozzles to facilitate band spraying and directional spraying. Often one to four nozzles may be mounted on slides, skids, or wheels for controlled differential placement of pesticides in emerged crops.

Boomless-nozzle, or broadcast, units consist of a single nozzle or a compact arrangement of nozzles mounted at the rear of a sprayer. They deliver a spray pattern of a wide swath to a distance of 18 feet or more on one or both sides of the sprayer. They are less expensive, simpler to operate, and

require less maintenance than boom units. However, accurate placement of the spray and uniform coverage of the area are difficult to obtain, because the slightest wind affects the spray pattern. The units are most effective in spraying herbicides along roadsides, ditchbanks, and fence rows. High-gallonage application rates are required.

### Nozzles

The nozzles determine the angle of spray, the type of spray pattern, and (along with the pressure) the spray droplet size and the rate of discharge.

One set of nozzles may be adequate for a field sprayer. The spray pattern and angle and the discharge rate can be varied by changing the replaceable tips or disks. Nozzle manufacturers furnish charts showing the discharge rate of the different tip or disk combinations at different spraying pressures.

Spray patterns may be the flat fan, hollow cone, or solid cone (fig. 3). The flat fan pattern is considered best for weed spray-

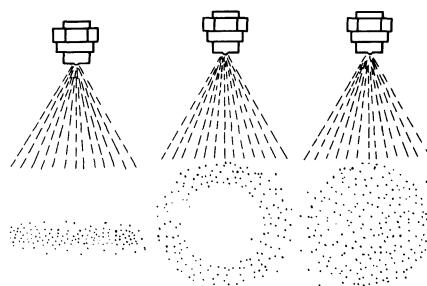


FIGURE 3.—Spray patterns. *Left to right:* Flat fan, hollow cone, and solid cone.



FIGURE 4.—Spraying fruit trees with a small general-use sprayer.

ing. Both the cone and flat-fan patterns are used in insect control.

Metal, ceramic, and nylon nozzles are available. Stainless steel, hardened steel, or ceramic nozzles and tips or disks should be used to spray abrasive wettable powders.

Nozzle extensions or drop pipes are available for more accurate placement of the spray and for underleaf coverage in row-crop spraying. Special kits may be obtained for attaching nozzles on a planter for band spraying for pre-emergence weed control.

### **Small General-Use Sprayers**

These sprayers include the power wheelbarrow sprayer, the estate or small wheel-mounted sprayer, and the small skid-mounted units. The last two are essentially the same sprayer on different mountings.

The sprayers are designed to handle spraying jobs that are just too large for hand equipment. Jobs for which they are used include garden spraying, small tree spraying, and nursery spraying (fig. 4).

Power wheelbarrow sprayers—smallest of the power-sprayer units—have reciprocating pumps (plunger or piston) that deliver  $1\frac{1}{2}$  to 3 gallons per minute and develop pressures up to 250 pounds. Power is supplied by an air-cooled engine of  $\frac{2}{3}$  to  $1\frac{1}{2}$  horsepower. (For greenhouse or other interior spraying jobs, a  $\frac{1}{2}$ -to  $\frac{3}{4}$ -horsepower electric motor can be used to operate the sprayer.) Tank sizes range from 12 to 18 gallons. Spray material in the tank may be mechanically or hydraulically agitated. Standard equipment includes adjustable hand gun and hose. Spray booms are available for some models.

Estate sprayers are small two-wheel-mounted units equipped with handles for moving manually. Trailer hitches for moving by vehicle are available as special equipment. Smaller models of these sprayers have 15- to 30-

gallon tanks and pumps that deliver  $1\frac{1}{2}$  to 3 gallons per minute at pressures up to 250 pounds. Larger models have 50-gallon tanks and pumps that deliver 3 to 4 gallons per minute at pressures up to 250 to 400 pounds. Power is supplied by an air-cooled engine of  $\frac{3}{4}$  to  $1\frac{1}{2}$  horsepower. Spray material in the tank is mechanically agitated. Standard equipment includes hand gun and hose. Spray booms are available for some models.

### Multiple-Purpose Farm Sprayers

These sprayers are designed to handle all or most of the spraying needs on general farms—from low-pressure weed<sup>1</sup> or row-crop spraying (30 to 50 pounds) up to higher pressure fruit-tree, field-crop, and livestock spraying (200 to 400 pounds or more) (figs. 5 and 6).

---

<sup>1</sup> See CAUTION, p. 15.



FIGURE 5.—Spraying corn for insect control with a multiple-purpose farm sprayer.

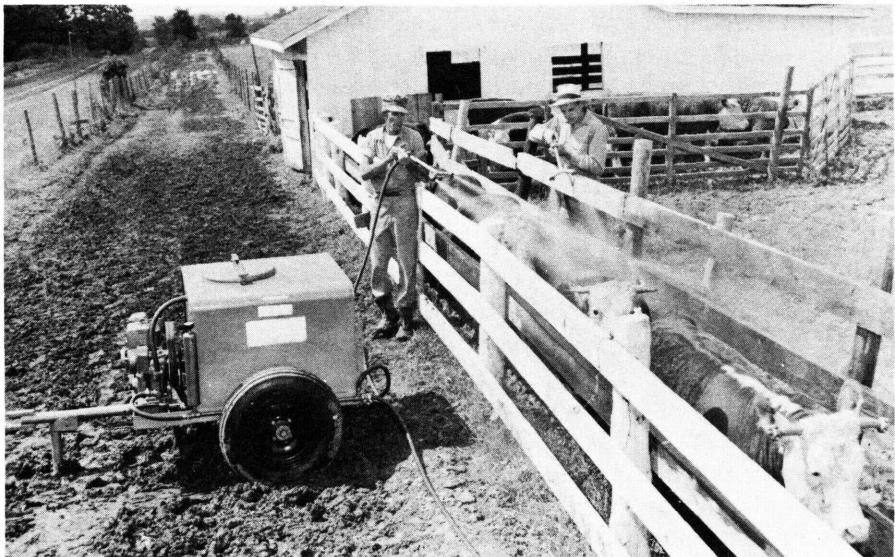


FIGURE 6.—Spraying cattle with a multiple-purpose farm sprayer.

The sprayers have plunger- or piston-type pumps that deliver 3 to 8 gallons per minute at pressures up to 800 pounds. Tanks range in size from 50 to 200 gallons. The spray material is mechanically agitated.

Skid mounted models are powered by an auxiliary engine. Wheel-mounted models may be powered by an auxiliary engine or by tractor power takeoff.

Hand gun and hose are standard equipment. Field booms, 20 to 30 feet in length, are available as optional equipment.

### **High-Pressure, High-Volume Sprayers**

These sprayers are used primarily by commercial growers of fruit and truck crops. They provide the high-pressure, high-volume spray delivery required for complete coverage of fruit trees

in full foliage and the dense growth of vine and other truck crops.

The sprayers are similar in design to multiple-purpose sprayers, but have pumps and tanks of larger capacity. The pumps deliver 8 to 60 gallons per minute at maximum pressures in the range of 400 to 1,000 pounds. Tanks range in size up to 600-gallon capacity.

Field booms designed for use with these sprayers may be the adjustable type or of special design for use on one specific crop.

Hydraulically operated one-side booms are often used to reduce soil compaction (caused by the weight of the sprayer) that might injure the roots of potatoes, tomatoes, and some other plants.

Hand guns or automatic spray heads are used for fruit-tree spraying.

## **Low-Pressure, Low-Volume Sprayers**

These sprayers are designed primarily for the low-pressure, low-volume spraying—less than 100 pounds pressure and 3 to 50 gallons-per-acre application—recommended for insect, disease, and weed control in crops (fig. 7).

The sprayers usually have rotary-type pumps, and the spray material in the tank is hydraulically agitated. This limits their use to sediment-free spray materials.

Tractor-mounted models consist of a kit of component parts (pump, valves, pressure gage, pressure regulator, spray boom, and brackets for mounting the boom and one or more metal drums), which the user mounts on the tractor. The pump mounts on the tractor and is operated by the power takeoff.

Wheel-mounted models may be operated by tractor power takeoff or by a separate engine. They may have a conventional sprayer tank of 50- to 250-gallon capacity

or one or more 55-gallon metal drums mounted on the trailer frame.

## **Self-Propelled, High-Clearance Sprayers**

These special-purpose machines are designed for spraying field and row crops that are too tall for conventional sprayers.

They consist of two basic units—a vehicle (or carrier) and a sprayer. The vehicle may be a tractor modified to clear plants 5 to 8 feet high or it may be a specially designed, self-propelled chassis (fig. 8).

Units designed around a tractor usually have a multiple-purpose, skid-mounted sprayer, which is attached to the frame. They may have three or four wheels, with the power applied to the rear wheels.

Chassis-type units usually have a low-pressure, low-volume sprayer, powered by a separate engine. They usually have three wheels, with the power applied to the one front wheel.



FIGURE 7.—Spraying soybeans.

The spray boom is usually mounted on the rear of self-propelled, high-clearance spray-

ers, and it can be raised or lowered to permit spraying high-and low-growing crops.

## AIR SPRAYERS

Air sprayers (also known as concentrate, blower, air-blast, and air-mist sprayers) are used for spraying orchards and large shade trees (fig. 9). Units are also available for spraying field and row crops (fig. 10).

The sprayers are designed to apply pesticides in concentrated form (up to 80 percent less water than conventional spray mixes). Concentrate spraying saves time, labor, and pesticide when treating large acreages.

The sprayers combine the action of a pump and fan to discharge the spray. A low-pressure, low-volume pump delivers the liquid spray material to the fan housing where it is discharged

into an air stream in small spray droplets by a group of nozzles or a shear plate and carried to the foliage to be treated by the air stream.

The sprayers are rated in terms of air capacity and velocity. They range from under 5,000 cubic feet of air per minute at 150 miles per hour to over 60,000 cubic feet of air per minute at 90 to 100 miles per hour.

The sprayers—both orchard and field-and-row-crop types—vary in design. Some can spray to either side or to both sides; others spray to one side only. One field-and-row-crop unit is mounted on a turntable that turns in an arc of more than 200°.



FIGURE 8.—Self-propelled, high-clearance sprayers are designed for spraying high-growing crops.



FIGURE 9.—Spraying apples for insect and disease control with an air sprayer.

Small air sprayers are commonly mounted on a wheelbarrow or cart-type chassis. Larger models are usually skid mounted for transport by truck or trailer, although wheel-mounted units are available.

Blower attachments are available that can be mounted at the rear of a hydraulic sprayer to convert it to an air-type sprayer. An attachment includes fan, power unit, and spray nozzles mounted in a frame.

## FOG APPLICATORS

Fog applicators, or aerosol generators, are not used much in agriculture, because of the type of spray produced. They are used mostly for temporary control of mosquitoes, flies, and other insects in buildings and in restricted outdoor areas.

The sprayers produce a fog, or mist, that remains in the air for a considerable time. The fog must contact the insects to be effective,

since there is little or no residual action.

Outdoor applications are usually made at night when temperature, humidity, and wind conditions are most favorable. An application cannot be made under excessive wind conditions, but some air movement is required to disperse the spray over the area to be treated.



FIGURE 10.—Spraying tomatoes with an air sprayer.

## OPERATION OF SPRAYERS

This section contains general precautions and instructions for operating power sprayers. More specific precautions and instructions may be found in the manufacturer's instruction manual that comes with a sprayer and in other USDA publications.

### Precautions

#### **Equipment operation**

Spray only those types of spray materials that the sprayer is designed to handle. Clear-solution and stable-emulsion sprays usually present no problem in sprayability. But wettable-powder sprays, emulsion sprays, and whitewash and cold-water paints require the constant and thorough agitation and a pump and nozzles designed to handle abrasive materials.

Make sure that the spray material in the tank is well mixed before you start to spray. Observe this precaution after any interruption or delay in the spraying operation.

Do not operate the sprayer be-

yond its rated capacity for an extended period. While manufacturers tend to rate their sprayers conservatively, best performance is obtained at the rated capacity.

Follow normal safety precautions for operating any equipment with moving parts. Keep shields in place.

Always throw the pump out of gear before working on it or on the sprayer.

Always relieve a hose of pressure before disconnecting it.

Check for leaking connections, particularly where a spray gun connects to the hose, to avoid contact of pesticide with the skin.

#### **Using pesticides**

Pesticides used improperly may be injurious to man and animals. Use them only when needed and handle them with care. Follow the directions and heed all precautions on the labels.

Keep pesticides in closed, well-labeled containers in a dry place. Store them where they will not contaminate food or feed, and

where children and animals cannot reach them.

When handling a pesticide, wear clean, dry clothing.

Avoid repeated or prolonged contact of pesticide with your skin.

Wear protective clothing and equipment if specified on the container label. Avoid prolonged inhalation of pesticide dusts or mists.

Avoid spilling pesticide concentrate on your skin, and keep it out of your eyes, nose, and mouth. If you spill any on your skin, wash it off immediately with soap and water. If you spill it on your clothing, launder the clothing before wearing it again.

After handling a pesticide, do not eat, drink, or smoke until you have washed your hands and face. Wash any exposed skin immediately after applying pesticide.

Avoid drift of pesticide to nearby wildlife habitats, bee yards, crops, or livestock.

To protect water resources, fish, and wildlife, do not contaminate lakes, streams, or ponds with pesticide. Do not clean spraying equipment or dump excess spray material near such water.

Do not apply pesticides to plants during hours when honey bees and other pollinating insects are visiting them.

Dispose of empty pesticide containers at a sanitary land-fill dump, or crush and bury them at least 18 inches deep in a level, isolated place where they will not contaminate water supplies.

If you have trash-collection service, wrap small containers in heavy layers of newspapers and place them in a trash can.

### **Application Rate**

The application rate of a sprayer—the number of gallons of spray material applied per treated acre—is determined by—

- Speed of travel.
- Spraying pressure.
- Number of nozzles and their rate of discharge.

The application rate may be increased by reducing the speed of travel, increasing the spraying pressure, or increasing the number of nozzles or the size of the nozzle orifice. The rate may be decreased by doing the reverse in each case.

In band spraying, the application rate also depends on the area covered by the nozzles. The rate may be increased or decreased by increasing or decreasing nozzle coverage.

A constant rate of speed is important in field spraying. Doubling the speed, for example, would cut the application rate in half. Maintaining a constant speed may be difficult, especially when going up and down hills. Use of a tractor speedometer is recommended.

You may want to temporarily change the application rate in the field. For example, a section of heavy weed growth might require heavier application than the rest of the field. Reducing the speed over that section would be the most convenient way of increasing the application rate.

Increasing the spraying pressure does not proportionately increase the discharge rate. With most nozzles, the pressure must be increased fourfold in order to double the discharge rate. Increasing the pressure also decreases the droplet size, which increases the drift hazard, and may affect the spray pattern.

When substantial change in the application rate is necessary, changing the nozzle tips or disks is more effective than changing the spraying pressure.

In spraying row crops, you may need to increase the rate of application per row because of an increase in the size of the plants. This can be done by increasing the number of nozzles spraying each row.

### **Calibration**

Sprayers should be calibrated at the start of each spraying operation and frequently thereafter.

Before starting to spray a field, check or calibrate the sprayer to determine whether it is spraying at the desired rate. Too heavy an application not only wastes pesticide, but may also harm the plants. Too light an application may be ineffective.

To calibrate or check a sprayer—

1. Set two stakes 40 rods apart (660 feet).

2. With the sprayer level, fill the tank with water. Operate the sprayer long enough to fill the supply system up to the shutoff valve. Check all nozzles and the pressure gage for proper opera-

tion. Refill the tank and mark the water line on a measuring stick.

NOTE: The thickness of the liquid spray material can affect the discharge rate. If the material is much thicker than water, use it to make the test instead of water.

3. Drive one round trip between stakes at the desired speed and with the sprayer in full operation. *Spraying should be done only between the stakes.*

4. With the sprayer level, measure the gallons required to refill the tank to the mark on the measuring stick.

5. Multiply the number of gallons of water required to refill the tank by 33 and divide by the width sprayed in feet. This gives the gallons per acre applied.

If calibration shows that the application rate is too high or too low, the rate may be changed as indicated under "Application Rate," page 13.

As a nozzle tip or disk wears, the orifice will enlarge and the discharge rate will be increased. Replace tips and disks to avoid excessive discharge rates.

### **Troubleshooting**

Troubles that may develop during the spraying operation include failure in delivery of spray material and loss of spraying pressure. Possible causes in each case are:

#### **NO DELIVERY**

Sprayer tank empty or nearly so.  
Air lock or air leak in suction line.  
Inlet or outlet hoses kinked.  
Sprayer tank vent plugged.  
Pump valve stuck either open or closed.  
Nozzle orifice, screen, or line clogged.

### **LOSS OF PRESSURE**

Suction or line screen partially clogged.  
Foam from violent agitation in the spray tank reducing pump suction.  
Pressure regulator not working properly.  
Pump coupling slipping on power take-off shaft.  
Belt slipping (if belt driven).  
Nozzle tips or disks worn or orifice too large for pump capacity.

Pump trouble:  
Valve sticking, worn, or corroded.  
Valve spring broken, weak, or missing.  
Valve seats worn or pitted.  
If piston type pump, cylinder, packing, or piston cups may be worn and leaking.  
If rotary-type pump, rotor, case, or rollers may be worn.  
Operating speed too low.

### **CARE AND MAINTENANCE OF SPRAYERS**

Manufacturers of power sprayers usually provide instructions for the care and maintenance of the equipment. Follow their instructions on lubrication, adjustment, and cleaning of all components.

Keep spare parts, such as nozzle tips and strainers and hoses and hose clamps, on hand for emergency replacements.

Most spray chemicals are corrosive or abrasive to metal and will shorten the life of the equipment. Clean your sprayer after each day's use. You can clean it quickly with a suspension of activated charcoal in water:

• Drain the tank and flush with clean water. Safely dispose of the

spray material drained from the tank (see the precautions for the use of pesticides p. 12).

- Fill the tank one-third full of water. For each 10 gallons of water, add  $\frac{1}{4}$  pound of activated charcoal and  $\frac{1}{8}$  to  $\frac{1}{4}$  pound of laundry detergent. Agitate this mixture vigorously to distribute the charcoal through the water.

- Wash the equipment for 2 minutes by swirling the liquid around in the tank so that it reaches all parts of the tank. Pump the liquid through the hose and nozzles.

- Drain the tank and rinse the equipment with clean water. Pump the water through the distribution system. To prevent

### **CAUTION**

**Even after thorough cleaning, spray equipment may contain traces of herbicide that can kill highly susceptible crops. To determine whether you can spray your crops safely with equipment that has been used for herbicides, check with your county agricultural agent or your State agricultural experiment station.**

**For greatest safety, do not use spray equipment for any other materials after you have used it for herbicides.**

freezing, be sure that all water drains from the unit.

• Nozzles may be disassembled and the strainers or screens washed or cleaned with com-

pressed air. A sharp sliver of soft wood or other soft material may be used to open a plugged nozzle tip; never use wire or metal.

## POWER DUSTERS

Power dusters are usually classified by the method of powering—engine or tractor power takeoff. They may also be divided into two general types—single-outlet units (one hose and nozzle) designed for orchard dusting and multiple-outlet units designed for field- and row-crop work.

### Component Parts

Power dusters in general have these essential parts: Dust hopper with agitator and adjustable feed regulator, fan, distribution system (hose and nozzles), and power source (fig. 11).

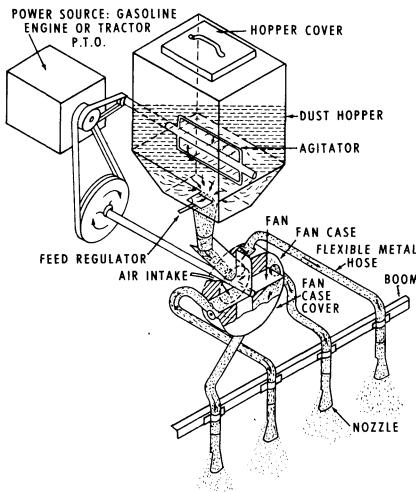


FIGURE 11.—Component parts of a typical power duster.

The units available differ in the type and capacity or size of components, method of powering, and method of mounting.

### Dust hopper

Dusters are available with hoppers ranging in volume from 2 to 4 cubic feet. Capacity of the hoppers ranges from 60 to 200 pounds of dust, and depends on the density of the dust.

Most units are equipped with internal-type agitators.

The feed regulators are adjustable to deliver dust at rates between 5 and 50 pounds per acre.

### Fan

Centrifugal-type fans are commonly used on power dusters. The fan case is fitted with one or more outlets, the number depending on the number of hoses attached.

The fans generally operate at speeds of 2,200 to 3,400 r.p.m. and deliver 500 to 1,000 c.f.m. of air at velocities of 50 to 100 m.p.h.

### Distribution system

Fruit-tree dusters usually have one discharge hose and nozzle. Vineyard units have two hoses and nozzles.

Field- and row-crop dusters may have four, six, or eight hoses

and nozzles; some may have as many as 18 (fig. 12). Outer ends of the hoses are mounted and spaced on a metal boom, 18 to 20 feet in length. The boom can be raised or lowered, and may be folded for transport.

For field-crop dusting, a tubular-type boom, 20 to 40 feet in length, is often used. It may have a series of discharge holes spaced on the bottom side or it may have an adjustable outlet slot.

Accessories are available for more effective dusting. Hose-support rods, for example, permit better dusting of low-growing crops and underleaf coverage. Y-shaped double-discharge hoses permit double coverage of rows.

#### **Mounting**

Engine-powered units may be mounted on a tractor or trailer or transported by truck or other vehicle. Units powered by tractor

power takeoff may be tractor or trailer mounted.

#### **Calibration**

Before starting a dusting operation, check the application rate of the duster unit. Dust mixtures vary in density, and the application rate can vary at a given setting of the feed regulator.

Follow this procedure:

1. Measure off an area of at least  $\frac{1}{2}$  acre (21,780 square feet).
2. Fill the dust hopper and set the feed regulator for the desired application rate.
3. Dust the measured area. Drive at a constant rate of speed, because rate of speed affects the application rate. Use of a tractor speedometer is recommended.
4. Refill the hopper from a weighed amount of dust. Subtract the weight of the remaining dust from the weight of the original amount. This gives the amount re-

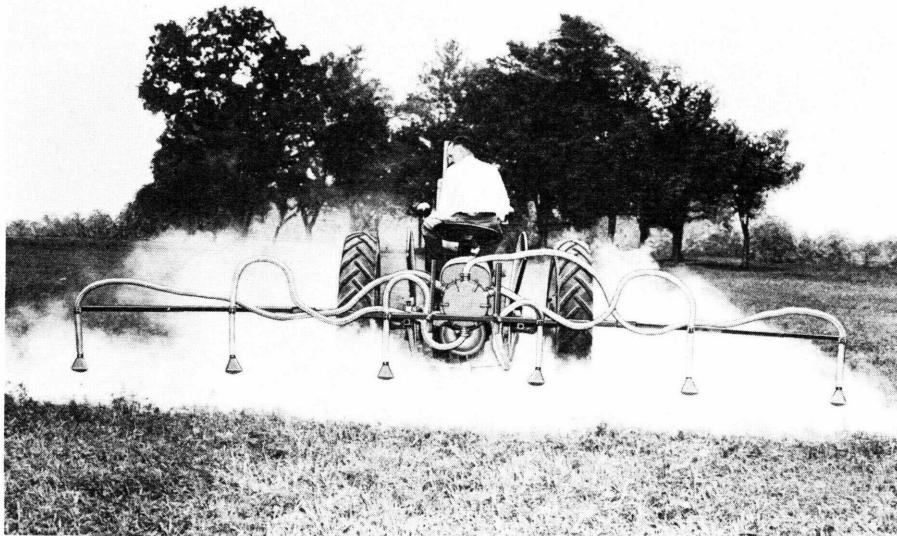


FIGURE 12.—Dusting alfalfa for insect control.

quired to fill the hopper and, therefore, the amount applied to the measured area.

### Care and Maintenance

Manufacturers of power dusters usually provide instructions for the care and maintenance of the equipment.

Clean the hopper of remaining

pesticide after each day's use.

Before storing the duster, clean it thoroughly. Spray or paint with a rust preventive all parts subject to rust or corrosion. Use kerosene or fuel oil on those parts, such as the agitator that will come in contact with the dust. Store the duster in a clean, dry place.



### CAUTION

Masks and protective clothing are required when using some pesticides; they are recommended when using any pesticide where there is danger of prolonged inhalation or contact with the skin. Follow the instructions on the label of the pesticide container. (See other precautions on page 12).